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(71) Patent Applicant: 000002141
Sumitomo Bakelite Co., Ltd.
2-5-8, Higashi-Shinagawa,
Shinagawa-ku, Tokyo

(72) Inventor: Tomoharu Miyamoto

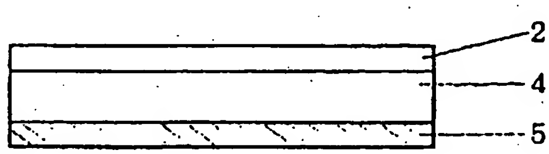
c/o Sumitomo Bakelite Co., Ltd.
2-5-8, Higashi-Shinagawa,
Shinagawa-ku, Tokyo

(54) [Title of the Invention] Cover tape for embossed carrier tape for surface mounting

(57) [ABSTRACT] (amended)

[Constitution]

A cover tape for embossed carrier tape for surface mounting which comprises an outer layer, an intermediate layer and an adhesive layer, wherein the outer layer is a biaxially oriented film of polyester or polypropylene; the intermediate layer is made of an ethylene-αolefin copolymer having a tear strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%; and the adhesive layer is made of an adhesive which is heat-sealable to a plastic carrier tape and which is any one of a polyurethane type resin, an acrylic type resin, a polyvinyl chloride type resin, an ethylene vinyl acetate type resin, a polyester type resin, a butadiene type resin and a styrene type resin, or a combination thereof, wherein an electroconductive fine powder of tin oxide or zinc oxide is dispersed in the adhesive.



2: Outer layer, 4: Intermediate layer, 5: Adhesive layer

[Effect]

No trouble of tape breakage occurs even when high speed operation of a mounting machine progress.

[Scope of Claim(s)]

[Claim 1] A cover tape for an embossed carrier tape for surface mounting, which is a cover tape heat-sealable to a plastic carrier tape having continuously formed thereon pockets for accommodating chip type electronic components, wherein the cover tape comprises an outer layer, an intermediate layer and an adhesive layer, wherein the outer layer is a biaxially oriented film of polyester or polypropylene; the intermediate layer is made of an ethylene-αolefin copolymer having a tear strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%; and the adhesive layer is made of an adhesive which is heat-sealable to a plastic carrier tape and which is any one of a polyurethane type resin, an acrylic type resin, a polyvinyl chloride type resin, an ethylene vinyl acetate type resin, a polyester type resin, a butadiene type resin and a styrene type resin, or a combination thereof, wherein an electroconductive fine powder of tin oxide or zinc oxide is dispersed in the adhesive, the electroconductive fine powder is added in an amount of from 10 to 1000 parts by weight based on 100 parts by weight of a base resin of the adhesive, a surface resistivity of the adhesive layer is at most 10^{13} $\Omega/\square$, a bonding strength between the adhesive layer of the cover tape and a sealing face of the carrier

tape is larger than an interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape, the interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape is 10 to 130 gr per 1 mm of the width of sealing, and the cover tape has a total light transmittance of at least 70% and a tensile impact strength of at least 400 kg-cm/cm^2.

[Claim 2] A cover tape for an embossed carrier tape for surface mounting, which is a cover tape heat-sealable to a plastic carrier tape having continuously formed thereon pockets for accommodating chip type electronic components, wherein the cover tape comprises an outer layer, a second layer at its inside, an intermediate layer at its inside and an adhesive layer, wherein the outer layer is a biaxially oriented film of polyester or polypropylene; the second layer is an oriented or non-oriented film of polypropylene or nylon; the intermediate layer is made of an ethylene-αolefin copolymer having a tear strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%; and the adhesive layer is made of an adhesive which is heat-sealable to a plastic carrier tape and which is any one of a polyurethane type resin, an acrylic type resin, a polyvinyl chloride type resin, an ethylene vinyl acetate type resin, a polyester type resin, a butadiene type resin and a styrene type resin, or a combination thereof, wherein an electroconductive fine powder of tin oxide or zinc oxide is dispersed in the adhesive, the

electroconductive fine powder is added in an amount of from 10 to 1000 parts by weight based on 100 parts by weight of a base resin of the adhesive, a surface resistivity of the adhesive layer is at most 10^{13} Ω/□, a bonding strength between the adhesive layer of the cover tape and a sealing face of the carrier tape is larger than an interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape, the interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape is 10 to 130 gr per 1 mm of the width of sealing, and the cover tape has a total light transmittance of at least 70% and a tensile impact strength of at least 400 kg-cm/cm^2.

[Claim 3] The cover tape for an embossed carrier tape for surface mounting according to Claim 1 or 2, wherein the resin of the ethylene-αolefin copolymer of the intermediate layer is obtained by polymerization by means of a catalyst of zirconocene dichloride and methylaluminoxane.

[Claim 4] The cover tape for an embossed carrier tape for surface mounting according to Claim 1, 2 or 3, wherein the resin of the ethylene-αolefin copolymer of the intermediate layer has a density of 0.900 to 0.925 g/cm^3, a melting point of at least 110℃, and a molecular weight ratio (degree of polydispersion) defined by a ratio of weight average molecular weight (Mw)/number average molecular weight (Mn) is at most 3.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Utilization]

The present invention relates to a cover tape heat-sealable to an embossed plastic carrier tape having pockets formed thereon, among the packaging having functions of protecting chip type electronic components from staining, aligning them so as to mount them on an electronic circuit board, and taking them out therefrom, at the time of storing, transporting and mounting the chip type electronic components.

[0002]

[Prior Art]

In recent years, chip type electronic components for surface mounting, for example, IC such as memories and logics, transistors, diodes and condensers, are packaged for service by a package which is constituted by an embossed plastic carrier tape having continuously formed thereon emboss-formed pockets which are capable of accommodating the electronic components depending upon their shapes, and a cover tape which is heat-sealable to the carrier tape. After the cover tape of the package is peeled off, the electronic components as the accommodated contents are automatically taken out and subjected to surface mounting on the electronic circuit board. The mounting techniques have been developed highly and precisely year by year, whereby the production efficiency is increased. Accordingly, the mounting speed of the electronic components has also been rapidly increased, and along this tendency, the installation for mounting has been modified so as to tightly rewind the cover tape, so that when the cover tape is peeled off to take out the electronic components at the time of mounting,

the cover tape will be securely taken out without failure in peeling. Further, the mounting tact reached to a very high speed level of at most 0.1 second/tact, and a mechanism in which the cover tape is spontaneously peeled off in at most 0.1 second becomes a mainstream. Accordingly, the cover tape is spontaneously peeled off by a very large power and subjected to a load of impact force larger than the ones conventionally given.

[0003]

Under such circumstances, recently, some trouble is frequently occurred in which the cove tape can no longer endure the stress at the time of peeling and thus is broken, namely "tape breakage", and becomes a main cause of the yield in production. Conventionally, the mounting speed is not so high and does not cause serious trouble, and as a measure for it, only an outer layer having a high mechanical strength is made thick. Most of cover tapes available in the market at present are simply constituted by two layers of a substrate layer/a sealant layer. However, since the overriding property of the sealant is a low temperature sealing property with the carrier tape, a resin being relatively flexible and having a low heat resistant and a low mechanical strength is chosen for this purpose. As the resin having excellent tear strength and impact strength as the sealant, low density olefins such as LLDPE and VLDPE may be mentioned. However, these resins have wide ranges of molecular weight and composition, and exhibit odor and tackiness of a film in a low molecular weight range, and

hindrance in a heat sealing property and poor transparency in a high molecular weight range, and thus the resistance to the tape breakage used to rely on the mechanical strength of the outer layer. However, if the outer layer becomes overly thick, the sealing property at a low temperature tends to be worsened, and there is a limit in such measures only with the thickness of the outer layer made of a single layer. Accordingly, when a very strong sealing is applied, if the tape is notched, tape breakage occurs and sufficient measures can not be conducted.

[0004]

[Problems that the Invention is to Solve]

In order to solve the above-mentioned problems, the present invention provides a cover tape which perfectly prevents the tape breakage when the cover tape is peeled off at the time of mounting, and at the same time, does not impair the low temperature sealing property and transparency, and has excellent mechanical strength, and which is heat-sealable to the embossed plastic carrier tape.

[0005]

[Means of Solving the Problems]

The present inventors have obtained a finding that a cover tape having excellent properties can be obtained from a composite film which comprises an outer layer, an intermediate layer at its inside, and an adhesive layer, wherein the outer layer is a biaxially oriented film; the intermediate layer is made of an ethylene-α olefin copolymer being excellent in a tear strength, an impact strength and a transparency and obtained

by means of a metallocene catalyst; and the adhesive layer has a structure obtained by coating a thermoplastic adhesive of a heat seal lacquer type having an electroconductive fine powder dispersed therein and has a surface resistivity of the adhesive layer of at most 10^{13} Ω and a total light transmittance of at least 70%; or a composite film which comprises an outer layer, a layer at its inside, being excellent in impact strength, an intermediate layer at its inside, and an adhesive layer, wherein the outer layer is a biaxially oriented film; the intermediate layer is made of an ethylene-α olefin copolymer being excellent in a tear strength, an impact strength and a transparency and obtained by means of a metallocene catalyst; and the adhesive layer has a structure obtained by coating a thermoplastic adhesive of a heat seal lacquer type having an electroconductive fine powder dispersed therein and has a surface resistivity of the adhesive layer of at most 10^{13} Ω and a total light transmittance of at least 70%. The present inventors have accomplished the present invention based on this discovery.

[0006]

Namely, the present invention provides:

A cover tape for an embossed carrier tape for surface mounting, which is a cover tape heat-sealable to a plastic carrier tape having continuously formed thereon pockets for accommodating chip type electronic components, wherein the cover tape comprises an outer layer, an intermediate layer and an adhesive layer, wherein the outer layer is a biaxially oriented film of polyester or polypropylene; the intermediate

layer is made of an ethylene-αolefin copolymer having a tear strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%, and in which the resin of the copolymer has a density of 0.900 to 0.925 g/cm^3, a melting point of at most 110℃ and a molecular weight ratio as defined by a weight average molecular weight (Mw)/a number average molecular weight (Mn) of at most 3, and is obtainable by polymerization by means of a metallocene catalyst; and the adhesive layer is made of an adhesive which is heat-sealable to a plastic carrier tape and which is any one of a polyurethane type resin, an acrylic type resin, a polyvinyl chloride type resin, an ethylene vinyl acetate type resin, a polyester type resin, a butadiene type resin and a styrene type resin, or a combination thereof, wherein an electroconductive fine powder of tin oxide or zinc oxide is dispersed in the adhesive, the electroconductive fine powder is added in an amount of from 10 to 1000 parts by weight based on 100 parts by weight of a base resin of the adhesive, a surface resistivity of the adhesive layer is at most 10^{13} $\Omega/\square$, a bonding strength between the adhesive layer of the cover tape and a sealing face of the carrier tape is larger than an interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape, the interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape is 10 to 130 gr per 1 mm of the width of sealing, and the cover tape has a total light transmittance of at least 70% and a tensile impact strength of

at least 400 kg-cm/cm^2, and

A cover tape for an embossed carrier tape for surface mounting, which is a cover tape heat-sealable to a plastic carrier tape having continuously formed thereon pockets for accommodating chip type electronic components, wherein the cover tape comprises an outer layer, a second layer at its inside, an intermediate layer at its inside and an adhesive layer, wherein the outer layer is a biaxially oriented film of polyester or polypropylene; the second layer is an oriented or non-oriented film of polypropylene or nylon; the intermediate layer is made of an ethylene-αolefin copolymer having a tear strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%, and in which the resin of the copolymer has a density of 0.900 to 0.925 g/cm^3, a melting point of at most 110℃ and a molecular weight ratio as defined by a weight average molecular weight (Mw)/a number average molecular weight (Mn) of at most 3, and is obtainable by polymerization by means of a metallocene catalyst; and the adhesive layer is made of an adhesive which is heat-sealable to a plastic carrier tape, and which is any one of a polyurethane type resin, an acrylic type resin, a polyvinyl chloride type resin, an ethylene vinyl acetate type resin, a polyester type resin, a butadiene type resin and a styrene type resin, or a combination thereof, wherein an electroconductive fine powder of tin oxide or zinc oxide is dispersed in the adhesive, the electroconductive fine powder is added in an amount of from 10

to 1000 parts by weight based on 100 parts by weight of a base resin of the adhesive, a surface resistivity of the adhesive layer is at most 10^{13} Ω/□, a bonding strength between the adhesive layer of the cover tape and a sealing face of the carrier tape is larger than an interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape, the interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape is 10 to 130 gr per 1 mm of the width of sealing, and the cover tape has a total light transmittance (JIS K 7105) of at least 70% and a tensile impact strength of at least 400 kg-cm/cm^2.

In each structure, the resin of the ethylene-α olefin copolymer of the intermediate layer is obtainable by polymerization by means of a zirconocene dichloride and methyl aluminoxane as catalysts.

[0007]

[Operation]

The constituting elements of a cover tape 1 of the present invention will be explained with reference to Figs. 1 and 2. In Fig. 1, an outer layer 2 is a biaxially oriented film of either one of a biaxially oriented polyester film and a biaxially oriented polypropylene film, and has a thickness of 6 to 25 μm, excellent transparency and heat resistance, and rigidity. If the outer layer is less than 6 μm in thickness, the rigidity tends to be lost, and if it exceeds 25 μm, this layer is likely too hard and the seal will be instable. An intermediate layer 4 is made of an ethylene-α olefin copolymer having a tear

strength (JIS K 7128) of at least 100 kg/cm, a tensile impact strength (ASTM D 1822) of at least 100 kg-cm/cm^2 and an opaqueness (JIS K 7105) of at most 15%, wherein the resin of the copolymer has a density of 0.900 to 0.925 g/cm^3, are melting point of at least 110°C, and a molecular weight ratio (degree of polydispersion) defined by a ratio of weight average molecular weight (Mw)/number average molecular weight (Mn) of at most 3, is obtained by polymerization by means of a metallocene catalyst. If the tensile strength is less than 100 kg/cm or the tensile impact strength is less than 100 kg-cm/cm, there is a risk of occurrence of tape breakage since it cannot endure the impact force at the time of high speed peeling. Further, if the opaqueness exceeds 15%, the transparency of the cover tape is remarkably reduced in its entirety, whereby the visibility of the device is reduced. If the density of the ethylene-α olefin copolymer as the intermediate layer resin is less than 0.900 g/cm^3, it becomes difficult to process it into a film, and if it exceeds 0.930, a low temperature sealing property becomes worse. Further, if the degree of polydispersion is 3 or higher, the sealing property becomes uneven, tackiness and odor of the film are generated, and the transparency is reduced, whereby excellent characteristics cannot be obtained. In such an instance, it is most preferred to use a resin polymerized by means of zirconocene dichloride and methyl aluminoxane i.e. a metallocene catalyst.

[0008]

The metallocene catalyst is called as a single site

catalyst of which the active sites are uniform, and which is distinguished from a conventional multi-site catalyst such as Zingler-Natta catalyst. In the case of the multi-site catalyst, since it has various types of active sites, the molecular weight distribution is wide and the comonomer content varies depending upon the molecules, such properties as a low temperature heat sealing property and transparency are affected by the wide distribution and naturally worsened. For example, by using LLDPE, it is possible to impart tear resistance and tensile impact resistance to LDPE, but the low temperature sealing property and transparency are worsened. On the other hand, since the active sites of the single site catalyst are uniform, the molecular weight distribution is narrow and the comonomer contents of respective molecules are substantially equal, whereby it is possible to obtain excellent low temperature sealing property and transparency. The side at which the intermediate layer 4 and the outer layer 2 contact with each other, may be if necessary, subjected to a surface treatment such as a corona treatment, a plasma treatment or a sand blast treatment, to improve the adhesion, and put together and adhered by dry laminate or extrusion laminate. The thickness of the intermediate layer is at least 10 μm, preferably 20 to 60 μm. If it is thinner than 10 μm, the effect for tear resistance is lost, and if it is thicker than 60 μm, the heat sealing property is worsened. The adhesive layer 5 is made of a single unit or combination of thermoplastic adhesives of a heat seal lacquer type, selected from a polyurethane type resin, an

acrylic type resin, an ethylene vinyl acetate type resin, a polyvinylchloride type resin, a polyester type resin, a butadiene type resin and a styrene type resin, whereby it has a property that it is heat-sealable to a plastic carrier tape as the subject.

[0009]

At the same time, in the adhesive, an electroconductive fine powder of either thin oxide or zinc oxide is uniformly dispersed. In this instance, the surface resistivity of the adhesive layer after the film formation is required to be at most 10^{13} Ω/□, more preferably 10^{6} Ω/□ to 10^{10} Ω/□. If it is larger than 10^{13} Ω/□, the electrostatic effect is extremely worsened and the desired performance cannot be obtained. Further, the added amount of the adhesive is, in view of the above surface resistivity, 10 to 1,000 parts by weight, more preferably 100 to 300 parts by weight based on 100 parts by weight of the base resin of the adhesive. If it is less than 10 parts by weight, electrostatic-preventing effect is not developed, and if it is larger than 1,000 parts by weight, the dispersibility into the adhesive is significantly worsened, such being unsuitable for production. Further, since the material for electrostatic treatment itself has electroconductivity, the electrostatic effect is semi-permanently imparted, and no bleed or the like is caused, whereby the sealing property is not adversely influenced. And, since the surface resistivity of the adhesive layer is adjusted to be at most 10^{13} Ω/□, even if the electronic components

happen to contact with the cover tape at the time of transportation while sealing the electronic components in the carrier tape with the cover tape, or when the cover tape if peeled off to pick up the electronic components, no static electricity is generated and the electronic components can be protected from the electrostatic hindrance. Here, in order to further increase the electrostatic effect, an antistatic-treating layer or an electroconductive layer may be provided on the outer layer side, namely, the surface and back faces of the biaxially oriented film. Further, as a method for forming a heat sealing type adhesive, both a melt film formation method and a solution film formation method may be used, but preferably the solution film formation method is desirable from the viewpoint of dispersibility of the electroconductive fine powder.

[0010]

Further, in a seal-peel step of the cover tape, first, the cover tape 1 is continuously sealed in a rail-like form with a width of 1 mm each on both sides of the carrier tape 6. (Fig. 3) Next, when the cover tape 1 is peeled off from the carrier tape 6 at the time of peeling, if the adhesion strength between the adhesive layer 5 of the cover tape 1 and the seal face of the carrier tape 6 is smaller than the interlayer adhesion strength between the intermediate layer 4 and adhesive layer 5 of the cover tape 1, the peel-off strength corresponds to the adhesion strength between the adhesive layer 5 of the cover tape 1 and the seal face of the carrier tape 6, and thus the peeling is conducted by an interface peeling which is the most common

peeling mechanism at present. On the other hand, like in the present invention, if the adhesion strength between the adhesive layer 5 of the cover tape 1 and the seal face of the carrier tape 6 is larger than the interlayer adhesion strength between the intermediate layer 4 and adhesive layer 5 of the cover tape 1, only the sealed portion of the formed adhesive layer 5 remains on the carrier tape (Fig. 4), and the cover tape after peeling (Fig. 5) is in such a form that only the heat-sealed portion of the adhesive layer 5 falls off, namely, the peeling is conducted by a so-called transfer peeling. Namely, the peel-off strength corresponds to the interlayer adhesion strength between the adhesive layer 5 and the intermediate layer 4, and the peeling face is incorporated in the cover tape, and its interlayer adhesion strength can be set irrespective of the material of the carrier tape, whereby stable peel-off strength can be obtained without receiving the influence of the sealing condition of the cover tape and the carrier tape. In this instance, the adhesive is selected so that the interlayer adhesion strength between the intermediate layer and adhesive layer of the cover tape will be 10 to 130 gr, more preferably 10 to 70 gr per 1 mm of the width of seal. If the peeling strength is lower than 10 gr, there is a problem that the cover tape happen to be detached at the time of transportation of packaging, whereby the electronic components as the content fall off. On the contrary, if it is higher than 130 gr, a phenomenon i.e. jumping trouble occurs in which the carrier tape vibrates when the cover tape is peeled and the electronic components fall off

out of the accommodating pockets immediately before the mounting. By using this transfer peeling mechanism, it is possible to obtain the desired properties that the dependency on the sealing conditions is low as compared with the conventional interface peeling, and at the same time, the change with the lapse of time of the peel-off strength due to storage environment is small. Further, since the cover tape is constituted so that its total light transmittance is at least 70%, preferably at least 80%, the electronic components sealed in the interior of the carrier tape can be observed with eyes or mechanically. If it is lower than 70%, the electronic components in the interior can hardly be confirmed.

[0011]

Next, in Fig. 2, the outer layer 2 and a second layer 3 at its inside are oriented or non-oriented films of polypropylene or nylon, and films having a thickness of 6 to 50 μm and being transparent and excellent in the impact resistance and tear resistance. If the layer 3 is less than 6 μm in thickness, the tear resistance is insufficient, and if it exceeds 50 μm, the sealing property is instable. By the way, there is a biaxially oriented nylon film as a film being excellent in transparency, heat resistance, tear resistance and impact resistance. However, if it is used for the outer layer, the slip property with a flat iron for heat sealing is poor, whereby it is not suitable for particularly a sliding type sealing machine. Further, since this has a large moisture absorptivity, when it is used for the outer layer, a problem

of blocking will occur and thus it is not suitable for the outer layer. The side at which the outer layer 2 and the layer 3 contact with each other, may, if necessary, be subjected to a surface treatment such as a corona treatment, a plasma treatment or a sand blast treatment to increase the adhesion and put together and adhered by laminate or dry laminate. Further, the intermediate layer 4 and adhesive layer 5 have the same structures as in Fig. 1.

[0012]

[Examples]

Examples of the present invention are shown below. However, it should be mentioned that the present invention is by no means restricted by these examples.

Examples 1 to 7 and Comparative Examples 1 to 5

As identified in the layer construction in Table 1 and Table 2, laminates having a biaxially oriented film as an outer layer and an intermediate layer provided at its inside, and laminates having provided between an outer layer and an intermediate layer, an oriented or non-oriented film being excellent in tear resistance and impact resistance, were prepared. A solution was coated for film formation of an adhesive layer in a thickness of 2 μm, by a roll coater, on one side of the intermediate layer opposite to the side at which the intermediate layer contacts with the outer layer or the intermediate layer contacts with the layer being excellent in tear resistance and impact resistance. Here, the density, melting point, tear strength of film, tensile impact strength

and opaqueness of the resin of the intermediate layer are also identified in Table 1 and Table 2. Further, the type and added amount of the electroconductive fine powder are indicated in the parenthesis after the adhesive layer. The added amount is an amount (parts by weight) to 100 parts by weight of a thermoplastic resin in the adhesive layer. The obtained test samples were slitted to a width of 13.5 mm, and then subjected to heat sealing with a polystyrene carrier tape having a width of 16 mm, followed by judging with respect to the presence or absence of tape breakage by use of a high speed peeling machine (42,000 mm/min) and also measuring a peeling strength (measurement speed: 300 mm/min). Further, the surface resistivity at the adhesive layer side and the visible light transmittance and tensile impact strength of the cover tape test samples were conducted and the results are indicated in Table 3 and Table 4

Heat sealing conditions: 120°C/1 kg/cm^2/1 sec, sliding type seal, seal width: 1mm × 2

Peeling conditions: 180° peeling, peeling speed: 300 mm/min, number of samples: 3

[0013]

The raw materials used are indicated below.

· PE: Polyethylene obtained by using a metallocene catalyst for polymerization

· PET: Polyethylene terephthalate (non-oriented)

· O-PET: Biaxially oriented polyethylene terephthalate

· PP: Polypropylene (non-oriented)

- OPP: Biaxially oriented polypropylene
- NY: Nylon (non-oriented)
- ONY: Biaxially oriented nylon
- EVA: Ethylene vinyl acetate copolymer
- PVC: Polyvinyl chloride
- LDPE: Low density polyethylene
- LLDPE: Straight chain low density polyethylene
- SnO_2: Tin oxide
- ZnO_2: Zinc oxide

[0014]

Table 1

	Examples					
	1	2	3	4	5	6
· Outer layer						
Resin used	O-PET	O-PET	O-PET	OPP	O-PET	OPP
Thickness (μm)	25	12	9	16	12	25
· Second layer						
Resin used	-	ONY	OPP	NY	OPP	-
Thickness (μm)		12	15	15	15	
· Intermediate layer						
Resin used	PE	PE	PE	PE	PE	PE
Thickness (μm)	20	30	50	15	40	30
Density (g/cm^3)	0.905	0905	0.910	0.920	0.915	0.905
Melting point (°C)	90	88	100	105	103	93
Tear strength (kg/cm)	124	145	120	110	130	145
Tensile impact strength ($kg\text{-}cm/cm^2$)	120	125	110	105	107	112
Opaqueness (%)	8	7	13	12	13	10
· Adhesive layer						
Adhesive used	PVC type	Acryl type	PET type	Polyurehtane type	EVA type	Buradiene type
Electroconductive fine powder (Parts by weight)	SnO_2 150	SnO_2 250	ZnO_2 320	ZnO_2 600	SnO_2 900	SnO_2 200

[0015]

Table 2

	Examples	Comparative Example				
	7	1	2	3	4	5
· Outer layer						
Resin used	O-PET	O-PET	OPP	O-PET	OPP	O-PET
Thickness (μm)	16	25	25	16	25	16
· Second layer						
Resin used	ONY	-	-	OPP	-	ONY
Thickness (μm)	12			15		12
· Intermediate layer						
Resin used	PE	LLDPE	-	5%EVA	LLDPE	LDPE
Thickness (μm)	40	30		30	20	40
Density (g/cm^3)	0.910	0.908		0.933	0.915	0.919
Melting point (°C)	102	120		125	125	128
Tear strength (kg/cm)	124	85		45	105	60
Tensile impact strength ($kg\text{-}cm/cm^2$)	120	75		35	100	45
Opaqueness (%)	11	20		13	18	8
· Adhesive layer						
Adhesive used	Styrene type	PET type	Polyurethane type	EVA type	Acryl type	EVA type
Electroconductive fine powder	SnO_2	ZnO_2	SnO_2	SnO_2	Surfactant	SnO_2
(Parts by weight)	400	150	7	1200	2	1500

[0016]

Table 3

	Examples					
	1	2	3	4	5	6
·Breakage of test tape in high speed peeling	Not occurred	Not occurred	Not occurred	Not occurred	Not occurred	Not occurred
·Peeling strength						
Initial value	40	45	30	25	43	52
40°C-90%, 30days	55	45	28	62	38	55
60°C, 30 days	68	50	55	75	80	68
·Type of peeling of adhesive layer	Transfer	Transfer	Transfer	Transfer	Transfer	Transfer
·Tensile impact strength ($kg\text{-}cm/cm^2$)	420	505	350	220	430	450
·Surface resistivity ($\Omega/\square$)	10^9	10^8	10^6	10^7	10^5	10^8
·Total light transmittance (%)	88.0	85.2	76.3	50.7	25.8	81.0

[0017]

Table 4

	Example	Comparative Examples				
	7	1	2	3	4	5
·Breakage of test tape in high speed peeling	Not occurred	Occurred	Occurred	Not occurred	Occurred	Not occurred
·Peeling strength						
Initial value	25	10	45	5	35	11
40°C-90%, 30days	30	5	15	0	5	2
60°C, 30 days	45	45	150	10	25	15
·Type of peeling of adhesive layer	Transfer	Transfer	Interface	Transfer	Transfer	Transfer
·Tensile impact strength ($kg\text{-}cm/cm^2$)	505	350	220	430	280	550
·Surface resistivity (Ω/□)	10^7	10^{12}	10^{14}	10^4	10^{14}	10^4
·Total light transmittance (%)	74.3	72.6	89.5	45.6	88.0	30.5

[0018]

[Effects of the Invention]

By using the cover tape of the present invention, the following five advantages can be accomplished. Even if high speed mounting of a mounting machine proceeds, there is no risk of occurrence of tape breakage trouble. Since the adhesive layer is already subjected to an electrostatic treatment, static electricity to be generated when the electronic components contact with the cover tape or the cover tape is peeled off, can be suppressed, and at the same time, the sealing properties are not influenced. By the combination of the heat seal lacquer adhesive and the intermediate layer, sealing can be made at a low temperature, and the peel-off strength can optionally be set within a range of 10 to 120 gr per 1 mm. Since the peel-off strength is determined by the adhesion strength between layers in the cover tape, the peel-off strength is not influenced by the sealing conditions with the carrier tape. Since the transparency is excellent, the devices as the incorporated contents can easily be inspected.

By the above five advantages, conventional problems of tape breakage at the time of peeling can be solved, and at the same time, the problem of large dependency of the peel-off strength on the sealing conditions, the problem of the change with the lapse of time depending upon the storage environment, and the problem of generation of static electricity generated when the electronic components contact with the cover tape or at the time of peeling the cover tape, can be solved, whereby

stable peel-off strength can be obtained.

[Brief Explanation of the Drawings]

[Fig. 1]

Cross sectional view showing the layer structure of the cover tape of the present invention

[Fig. 2]

Cross sectional view showing the layer structure of the cover tape of the present invention

[Fig. 3]

Cross sectional view showing a state in use where the cover tape of the present invention is adhered to the carrier tape

[Fig. 4]

Cross sectional view of the cover tape of the present invention showing a state where the cover tape is peeled from the carrier tape

[Fig. 5]

Cross sectional view of the carrier tape showing a state where the cover tape of the present invention is peeled off

Fig. 1

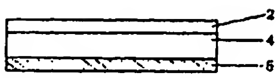


Fig. 2

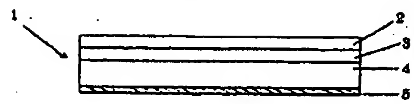


Fig. 3

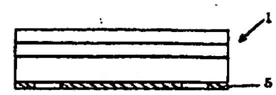


Fig. 4

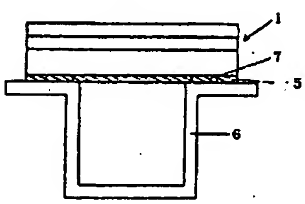
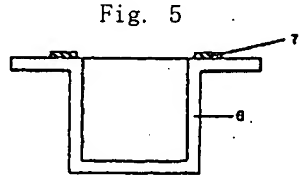


Fig. 5



1: Cover tape, 2: Outer layer, 3: Second layer, 4: Intermediate layer, 5: Adhesive layer, 6: Carrier tape, 7: Heat-sealed portion of adhesive layer